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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/144,579	08/31/1998	DAH WEN TSANG	1138-71	4972

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EXAMINER

HU, SHOUXIANG

ART UNIT	PAPER NUMBER
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2811

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/31/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

09/144,579

Applicant(s)

TSANG ET AL.

Examiner

Shouxiang Hu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 November 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 43,47-66,98-101 and 103 is/are pending in the application.
- 4a) Of the above claim(s) 98-101 and 103 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 43 and 47-66 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 November 2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>11/03/2006</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

Claims 98-101 and 103, which were added in the 5-23-2001 amendment and further amended in the 11-03-2006 amendment, are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons:

Claim 98 recites at least the subject matters of: "said conductive gate structure comprising a doped polysilicon layer overlying the gate oxide layer; and a first metal layer comprising aluminum including a first portion extending over the doped polysilicon and a second portion contacting the source semiconductor material". However, such subject matters imply that the relevant MOSFET to be a planar type one that enables the formation of the layer of the recited aluminum on both of the gate layer of the recited polysilicon and the surface of the recited source semiconductor material, since only the planar-type MOSFET structure may allow the simultaneous exposures of the two during the depositing of the layer of the recited aluminum, as evidenced in the newly added Figs 6B and/or 6C. And, these recited subject matters are unreadable on the invention originally claimed in the instant invention which is directed to a trench-gated type MOSFET that is substantially patentably distinct from that of the planar type defined in claim 98.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 98-101 and 103 are withdrawn from

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consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Accordingly, claims 43, 47-54, 55-66, 98-101 and 103 are pending in this application; and claims 43, 47-54 and 55-66 remain active in this office action.

Drawings

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the subject matters of the recited gate, trench and PN junction recited in claim 43, in combination with the subject matters of:

“the vertically-extending source conductor contacting the vertically-oriented layer on a side thereof opposite the gate oxide layer and gate conductor, the source conductor electrically shorting the source region to the active body region across the PN junction; the gate conductor comprising doped polysilicon contacting the gate oxide layer within the trench and a first metal layer defining a gate metal layer overlying the doped polysilicon of the gate conductor; an insulating layer overlying the conductor; and an upper metal layer over the insulating layer and having a first portion contacting the gate conductor through a via in the insulating layer and a second portion coupled to the source region in electrical isolation from the gate conductor”

also recited in claim 43 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

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Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

The drawings are further objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: many of the reference characters shown in Figs. 16 B and 16C are not mentioned in the amend specification. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing

sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Response to Amendment

The amendment filed on 12/14/2000 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows:

The newly added three paragraphs starting with "Further to the completion and as incorporated herein by reference to U.S. Pat. No. 5,262,336, for example, a second layer of metal is deposited in gate pad regions of the gate contact layer in isolation from the source pads over a passivation layer" inserted on page 14, after line 28, appear to imply the subject matters that, further to the completion of the trench-gated type MOSFET shown in Fig. 12 in the instant invention, the contact structures (including source contact 28 and the gate contact 30) shown in Fig. 16B in US Patent 5,262,336 are further formed/applied to the structure shown in Fig. 12 in the instant invention. However, full support for such subject matters are not found in the original disclosure of

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the instant invention and/or in any of the original disclosures of its parent applications, including the ones of US Patents 4,895,810 and/or 5,262,336. None of these disclosures originally discloses that the contact structures including the ones shown in Fig. 16B in US Patent 5,262,336 and/or in Fig. 19 in US Patent 4,895,810 can be used in the trench-gated type MOSFET of in the instant invention following the structure shown in Fig. 12 therein. In fact, the contact structures shown in the two patent patents are associated with planar-gate type MOSFET devices, which allows the simultaneous exposures of the source semiconductor region 24 and the gate conductor (32) during the depositing of the contact layer with two isolated portions (75 and 76 in Fig. 19 of 4,895,810; and/or, 28 and 30 in Fig. 16B of 5,262,336, wherein the contact 28 is not even in direct contact with the source region 24, instead the connection is via the doped region 67 in the base region 22). Obviously, such planar-type contact structures are not directly applicable to the trench-gated structure of the instant invention, given that the gate contact (62 in Fig. 12) in the active region is fully surrounded by insulating layers (60, 48 and 68) during the formation of the source contact (94).

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 43, 47-54 and 55-66 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject

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matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim 43 recites the subject matters of the recited gate, trench and PN junction recited in claim 43, in combination with the subject matters of:

“the vertically-extending source conductor contacting the vertically-oriented layer on a side thereof opposite the gate oxide layer and gate conductor, the source conductor electrically shorting the source region to the active body region across the PN junction; the gate conductor comprising doped polysilicon contacting the gate oxide layer within the trench and a first metal layer defining a gate metal layer overlying the doped polysilicon of the gate conductor; an insulating layer overlying the conductor; and an upper metal layer over the insulating layer and having a first portion contacting the gate conductor through a via in the insulating layer and a second portion coupled to the source region in electrical isolation from the gate conductor”

These combined subject matters as recited in the claims appear to imply the subject matters that the contact structures disclosed in US Patents 5,262,336 and/or 4,895,810 are formed/applied to the trench-gate type structure in the instant invention. However, full support for such combination of subject matters cannot be found in the original disclosure of the instant invention and/or in any of the original disclosures of its parent applications, including the ones of US Patents 4,895,810 and/or 5,262,336. None of these disclosures originally discloses that the contact structures including the ones shown in Fig. 16B in US Patent 5,262,336 and/or in Fig. 19 in US Patent 4,895,810 can

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be used in the trench-gated type MOSFET of the instant invention. In fact, the contact structures shown in the two patent patents are associated with planar-gate type MOSFET devices, which requires and allows the simultaneous exposures of the source semiconductor region 24 and the gate conductor (32) during the depositing of the contact layer with two isolated portions (75 and 76 in Fig. 19 of 4,895,810; and/or, 28 and 30 in Fig. 16B of 5,262,336, wherein the contact 28 is not even in direct contact with the source region 24, instead the connection between them is via the doped region 67 in the base region 22). The disclosure lacks an adequate description regarding how and/or where such planar-type contact structures (including the gate contact and the source contact) could be applied to the trench-gated structure of the instant invention, given that the gate contact (62 in Fig. 12) in the active region is already formed and fully surrounded by insulating layers (60, 48 and 68) during the formation of the source contact (94) the instant invention. It is also not clear how the recited "upper metal layer" could be formed, given that the source region and the gate contact in the active region are already fully covered by the front side metal 94 shown in Figs. 12 and 13 in the instant invention.

In addition, the subject matter recited in claim 43 about the "first metal layer" is also found to be not fully supported by the original disclosures, since none of the above-mentioned disclosures originally discloses the subject matters a gate in the recited trench comprising the recited first metal in combination with the recited subject matter of the recited upper layer with the recited insulating layer therebetween.

Response to Arguments

Applicant's arguments filed on 11/03/2006 have been fully considered but they are not persuasive. Responses to these arguments have been incorporated into the claim rejection and other relevant sections above.

In addition, it is noted that applicant's arguments appear to allege that the claimed invention as defined in claim 43 is fully supported by the instant application in view of its parent applications. It is not convincing, since none of these applications discloses any incorporation of the gate/source contact structure of the planar-gate type MOSFET device in any of the parent applications into the trench-gate type MOSFET of in the instant invention. What disclosed at page 20, lines 3-8 in the instant application as identified by the applicant, does not in any way suggest the incorporation of the gate/source contact structures of the planar-gate type MOSFET device into the trench-gate type MOSFET itself as defined in claim 43, even though it may suggest the formation of the two types of MOSFETs on the same die (at different positions).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shouxiang Hu whose telephone number is 571-272-1654. The examiner can normally be reached on Monday through Friday, 8:30 AM to 5:00 PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard T. Elms can be reached on 571-272-1869. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SH
January 19, 2007



SHOUXIANG HU
PRIMARY EXAMINER